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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/582,929	04/12/2007	Stephen Wayne Beadle	2003 B136/2	6582
23455 7590 06/19/2009 EXXONMOBIL CHEMICAL COMPANY 5200 BAYWAY DRIVE P.O. BOX 2149 BAYTOWN, TX 77522-2149				
EXAMINER				
BULLOCK, IN SUK C				
ART UNIT		PAPER NUMBER		
1797				
MAIL DATE		DELIVERY MODE		
06/19/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/582,929

**Applicant(s)**

BEADLE ET AL.

**Examiner**

IN SUK BULLOCK

**Art Unit**

1797

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 March 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-14 and 16-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 16-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SF/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Amendment***

Amendment to claims 1, 8 and 9, cancellation of claim 15, and addition of new claim 21 are acknowledged.

Claims 1-14 and 16-21 are currently pending in this application.

In response to the amendment, claims rejected under §112 and § 102 are withdrawn.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

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were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-14 and 16-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicants' submitted NPL to Cavani et al, entitled "Effect of Water in the Performance of the Solid Phosphoric Acid Catalyst for Alkylation of Benzene to Cumene and for Oligomerization of Propene" (hereinafter "Cavani") in view of WO 93/16020 (hereinafter "WO").

Cavani discloses the importance of water content in feedstock for both alkylation and oligomerization applications in the presence of a solid phosphoric acid catalyst. The water content in the reactor inlet essentially depends on the moisture content of the fresh feedstock (therefore on its temperature and composition), on the presence of some pretreatments of the feedstock itself, on the amount of recycled feed, as well as on the amount of injected water in the feed stream. A certain amount of water is necessary to maintain the Bronsted acidity of the catalyst. Under typical industrial operation the water content in the reactor inlet can range from 100 to 1000 wt. ppm in the case of propylene oligomerization and from 50 to 300 ppm in the case of cumene synthesis. When water in the feedstock is not strictly controlled, it has an effect on the productivity as well as the purity of the product. Furthermore, the overall life of the catalyst can be improved by an accurate control of the water content. See page 178,

paragraph 4 to page 179, paragraph 1. Cavani conducted experimental tests where the water content of the feedstream was measured with an online moisture analyzer (page 179, paragraph 2 to page 180, paragraph 4). From the results of the experimental tests, Cavani discloses that the best operating conditions are dictated by the type of application. Cavani further discloses drying pretreatment of the feedstock may be appropriate where the feedstock contains higher than required water content. See page 193, paragraph 1. Cavani, also, discloses using multitubular reactors (page 180, paragraph 4) and chamber reactors (page 194, 1st paragraph).

Cavani does not explicitly disclose that the water content of the feed is greater during the initial phase of the process of conversion than at the latter phase of the process of conversion.

In view of the teachings by Cavani that (1) the moisture level in the feed fluctuates with time-on-stream, (2) the criticality of controlling water in the feed to maintain acidity of the catalyst, and (3) using an online moisture analyzer to measure the water content of the feedstream, it would have been obvious to one skilled in the art to optimize the amount of water necessary, including reducing the amount of water from an initial phase of 450-800 wt ppm to 250-400 wt ppm, in the process to obtain and maintain high productivity and purity of the desired product (page 178, last paragraph bridging page 179). Optimization of a cause effective variable is a prima facie evidence of obviousness. *In re Woodruff*, 16 USPQ2d 1934, 1396 (Fed. Cir. 1990).

With regard to the limitation of separating unreacted olefins from the conversion products and recycling the separated unreacted olefins, it would have been obvious to a

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one having ordinary skill in the art to separate unconverted reactants from the product and recycle the separated unconverted reactants for a more efficient and economical process.

The WO reference discloses a process for oligomerization of C2-C12 alkene containing feedstock having a water content of 0.054 to 0.25 molar % to produce C5 to C20 olefins (page 3, lines 9-20). Any known zeolite catalyst which is active in alkene oligomerization may be employed (page 4, lines 20-35). The reaction conditions include a temperature not exceeding 260° C (page 4, lines 4-7).

With regard to the limitation of oligomerization of a mixture of C3 and C4 olefins and a catalyst comprising a zeolite, it would have been obvious to one skilled in the art to have modified the process of Cavani and included oligomerization of a mixture of C3 and C4 olefins as disclosed by WO (page 12, lines 28-37) because WO discloses a similar oligomerization process including the criticality of having a feed containing water. Also, like Cavani, WO recognizes the advantages of using zeolites over a solid phosphoric acid catalyst. Furthermore, WO explicitly discloses using zeolites in the oligomerization of alkenes and the affect of including water in the process which extends the life of the zeolite catalysts. Therefore, it is within the level of one having ordinary skill in the art to have modified the process of Cavani by employing zeolites in the oligomerization process due to the advantages of using zeolites over a solid phosphoric acid as taught by WO (see page 1, lines 10-14).

With regard to the limitation of using water wash, WO discloses saturating the feed with, i.e., water wash (page 4, lines 9-16).

With regard to the claimed step of purifying the conversion products including the step of desulphurization, it would have been obvious to one skilled in the art to have purified the conversion product for subsequent downstream processing to obtain a more efficient and improved processing and higher yield of desired products.

With regard to the claimed conversion conditions including a temperature from about 200° to 300° C when the catalyst is a solid phosphoric acid, it would have been obvious to one having ordinary skill in the art to have determined the optimum conversion conditions including the claimed temperature range through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

### ***Response to Arguments***

Applicants' arguments filed 3/5/2009 have been fully considered but they are not persuasive.

Applicants argue that neither Cavani nor WO discloses "a reduction in the amount of water in the feed contacting the catalyst from the initiation onward." The argument is not persuasive because Cavani discloses criticality of controlling the amount of water in the feed and measuring online the moisture content of the feedstream. Therefore, it would have been obvious to one skilled in the art to make necessary adjustments in the amount of water in the feedstream in response to the results from online monitoring of the moisture content in the feedstream.

Applicants argue that "it is merely a guess as to whether or not the substitution of zeolites in Cavani et al. would behave in the same manner as phosphoric acid." The argument is not persuasive because WO discloses the necessity of hydrating the zeolite catalysts as Cavani discloses the same for the phosphoric acid catalyst.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **IN SUK BULLOCK** whose telephone number is (571)272-5954. The examiner can normally be reached on Monday - Friday 8:00-4:30.



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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/In Suk Bullock/  
Primary Examiner, Art Unit 1797